Claims

What is claimed is:

1. A method for tracking motion phase of an object comprising:
receiving a plurality of projection data indicative of at least a cross-sectional image of the object, the projection data being in dependence upon a detector signal indicative of attenuation of an X-ray beam along a line through the object between an X-ray source and a detector, the projection data being acquired such that the projection data are in dependence upon the attenuation along different lines through the object and in dependence upon the attenuation along same lines through the object at different time instances;
processing the projection data for determining motion projection data of the object indicative of motion of the object based on the attenuation along at least a same line through the object at different time instances;
selecting a motion phase of the object from the motion projection data; and,
selecting the projection data acquired at time instances within the selected motion phase of the object.

2. A method for tracking motion phase of an object as defined in claim 1 wherein the plurality of projection data are helical projection data and comprising:
determining a subset of the helical projection data suitable for determining projection data indicative of an image of the object for at least a predetermined cross-section; and,
determining the projection data indicative of the image of the object for the at least a predetermined cross-section from the subset of the helical projection data using interpolation.

3. A method for tracking motion phase of an object as defined in claim 2 wherein the projection data indicative of the image of the object for the at least a predetermined cross-section are determined before processing the projection data for determining motion projection data of the object indicative of motion of the object.

4. A method for tracking motion phase of an object as defined in claim 2 wherein the projection data indicative of the image of the object for the at least a predetermined cross-section are

determined after processing the projection data for determining motion projection data of the object indicative of motion of the object.

5. A method for tracking motion phase of an object as defined in claim 1 wherein the selected motion phase is a motion phase with the object moving the least.

6. A method for tracking motion phase of an object as defined in claim 5 wherein the selected projection data comprise a plurality of portions of consecutively acquired projection data.

7. A method for tracking motion phase of an object as defined in claim 5 comprising reconstructing a tomographic image from the selected projection data.

8. A method for tracking motion phase of an object as defined in claim 5 wherein processing the projection data comprises:
SOC processing the projection data for removing a signal component in dependence upon stationarity of the object; and,
using an unwrapping filter processing the SOC processed projection data for recovering temporal information.

9. A method for tracking motion phase of an object as defined in claim 8 wherein processing the SOC processed projection data comprises:
transforming the SOC processed projection data into Fourier domain using FFT, the FFT being applied according to a shift of the projection data in the SOC process;
processing the transformed SOC processed projection data for determining a signal component in dependence upon motion of the object; and,
determining motion projection data by transforming the signal component in dependence upon motion of the object into time domain using inverse FFT.

10. A method for tracking motion phase of an object as defined in claim 9 wherein the projection data are shifted equivalent to one rotation of the detector around the object.

11. A method for tracking motion phase of an object as defined in claim 9 wherein the detector comprises a detector array.

12. A method for tracking motion phase of an object as defined in claim 11 comprising adding signals of a plurality of detectors of the detector array for each projection forming a single signal for each projection.

13. A method for tracking motion phase of an object as defined in claim 11 wherein the projection data are processed using symmetry property of a Radon transform of the projection data.

14. A method for tracking motion phase of an object as defined in claim 13 wherein the projection data are shifted equivalent to half a rotation of the detector array around the object.

15. A method for tracking motion phase of an object as defined in claim 9 comprising sliding window processing of the motion projection data.

16. A method for tracking motion phase of an object as defined in claim 5 wherein the motion projection data are determined in dependence upon an integral of a Radon transform of the projection data.

17. A method for tracking motion phase of an object as defined in claim 16 wherein the detector comprises a detector array.

18. A method for tracking motion phase of an object as defined in claim 17 wherein the integral of the Radon transform is determined from a pN by M sinogram matrix with pN being total number of projections and M being number of detectors in a detector array as sum of the sinogram matrix along M.

19. A method for tracking motion phase of an object as defined in claim 16 comprising sliding window processing of the motion projection data.

20. A method for tracking motion phase of an object as defined in claim 18 wherein the projection data are parallel beam projection data.

21. A method for tracking motion phase of an object as defined in claim 18 wherein the projection data are fan beam projection data.

22. A method for tracking motion phase of an object as defined in claim 21 comprising re-sorting the fan beam projection data into parallel beam projection data.

23. A method for tracking motion phase of an object comprising the steps for:
receiving a plurality of projection data indicative of at least a cross-sectional image of the object, the projection data being in dependence upon a detector signal indicative of attenuation of an X-ray beam along a line through the object between an X-ray source and a detector, the projection data being acquired such that the projection data are in dependence upon the attenuation along different lines through the object and in dependence upon the attenuation along same lines through the object at different time instances;
processing the projection data for determining motion projection data of the object indicative of motion of the object based on the attenuation along at least a same line through the object at different time instances;
selecting a motion phase of the object from the motion projection data; and,
selecting the projection data acquired at time instances within the selected motion phase of the object.

24. A method for tracking motion phase of an object comprising:
providing an X-ray source and at least a detector;
using the at least a detector sensing X-ray beam radiation attenuated by the object along a line through the object between the X-ray source and the detector and providing projection data in dependence thereupon;

rotating the X-ray source and the at least a detector around the object for acquiring projection data in dependence upon the attenuation of the X-ray beam along different lines through the object;
rotating the X-ray source and the at least a detector around the object a plurality of times for acquiring projection data in dependence upon the attenuation of the X-ray beam along same lines at different time instances;
processing the projection data for determining motion projection data of the object indicative of motion of the object based on the attenuation along at least a same line through the object at different time instances;
selecting a motion phase of the object from the motion projection data; and,
selecting the projection data acquired at time instances within the selected motion phase of the object.

25. A method for tracking motion phase of an object as defined in claim 24 comprising translationally moving the object along an axis of rotation of the X-ray source and the at least a detector.

26. A method for tracking motion phase of an object as defined in claim 25 comprising:
determining a subset of the projection data suitable for determining projection data indicative of an image of the object for at least a predetermined cross-section; and,
determining the projection data indicative of the image of the object for the at least a predetermined cross-section from the subset of the projection data using interpolation.

27. A method for tracking motion phase of an object as defined in claim 26 wherein the projection data indicative of the image of the object for the at least a predetermined cross-section are determined before processing the projection data for determining motion projection data of the object indicative of motion of the object.

28. A method for tracking motion phase of an object as defined in claim 26 wherein the projection data indicative of the image of the object for the at least a predetermined cross-section

are determined after processing the projection data for determining motion projection data of the object indicative of motion of the object.

29. A method for tracking motion phase of an object as defined in claim 24 wherein processing the projection data comprises:
SOC processing the projection data for removing a signal component in dependence upon stationarity of the object; and,
using an unwrapping filter processing the SOC processed projection data for recovering temporal information.

30. A method for tracking motion phase of an object as defined in claim 29 wherein processing the SOC processed projection data comprises:
transforming the SOC processed projection data into Fourier domain using FFT, the FFT being applied according to a shift of the projection data in the SOC process;
processing the transformed SOC processed projection data for determining a signal component in dependence upon motion of the object; and,
determining motion projection data by transforming the signal component in dependence upon motion of the object into time domain using inverse FFT.

31. A method for tracking motion phase of an object as defined in claim 24 wherein the motion projection data are determined in dependence upon an integral of a Radon transform of the projection data.

32. A method for tracking motion phase of an object comprising the steps for:
providing an X-ray source and at least a detector;
using the at least a detector sensing X-ray beam radiation attenuated by the object along a line through the object between the X-ray source and the detector and providing projection data in dependence thereupon;
rotating the X-ray source and the at least a detector around the object for acquiring projection data in dependence upon the attenuation of the X-ray beam along different lines through the object;

rotating the X-ray source and the at least a detector around the object a plurality of times for acquiring projection data in dependence upon the attenuation of the X-ray beam along same lines at different time instances;
processing the projection data for determining motion projection data of the object indicative of motion of the object based on the attenuation along at least a same line through the object at different time instances;
selecting a motion phase of the object from the motion projection data; and,
selecting the projection data acquired at time instances within the selected motion phase of the object.

33. A storage medium having stored therein data relating to executable commands for execution on a processor, the commands when executed for resulting in:
receiving a plurality of projection data indicative of at least a cross-sectional image of the object, the projection data being in dependence upon a detector signal indicative of attenuation of an X-ray beam along a line through the object between an X-ray source and a detector, the projection data being acquired such that the projection data are in dependence upon the attenuation along different lines through the object and in dependence upon the attenuation along same lines through the object at different time instances;
processing the projection data for determining motion projection data of the object indicative of motion of the object based on the attenuation along at least a same line through the object at different time instances;
selecting a motion phase of the object from the motion projection data; and,
selecting the projection data acquired at time instances within the selected motion phase of the object.

34. A storage medium as defined in claim 33 having stored therein data relating to executable commands for execution on a processor, the commands when executed for resulting in:
determining a subset of the projection data suitable for determining projection data indicative of an image of the object for at least a predetermined cross-section; and,
determining the projection data indicative of the image of the object for the at least a predetermined cross-section from the subset of the projection data using interpolation.

35. A storage medium as defined in claim 33 having stored therein data relating to executable commands for execution on a processor, the commands when executed for resulting in:
SOC processing the projection data for removing a signal component in dependence upon stationarity of the object; and,
using an unwrapping filter processing the SOC processed projection data for recovering temporal information.

36. A storage medium as defined in claim 35 having stored therein data relating to executable commands for execution on a processor, the commands when executed for resulting in:
transforming the SOC processed projection data into Fourier domain using FFT, the FFT being applied according to a shift of the projection data in the SOC process;
processing the transformed SOC processed projection data for determining a signal component in dependence upon motion of the object; and,
determining motion projection data by transforming the signal component in dependence upon motion of the object into time domain using inverse FFT.

37. A storage medium as defined in claim 33 having stored therein data relating to executable commands for execution on a processor, the commands when executed for resulting in:
determining motion projection data in dependence upon an integral of a Radon transform of the projection data.